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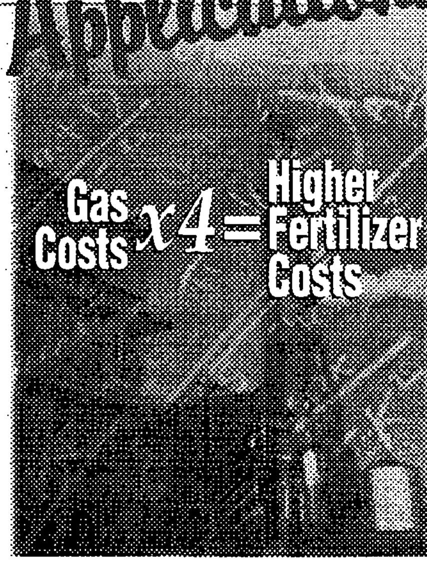
CARGILL FERTILIZER Applications

Volume 16 Number 1 Spring 2001



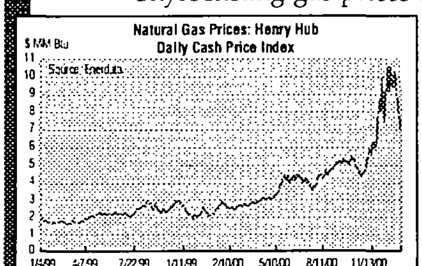
The math is straightforward. The explosion of natural gas prices equals sharply increased operating costs for the North American nitrogen industry.

That has forced domestic producers to either pass on higher costs to buyers or shut down. Cost-push pressures have boosted North American nitrogen prices, setting off a chain of reactions in fertilizer markets.

It is uncertain how the process will shake out – that will depend largely on relative gas prices. One thing is certain. High nitrogen prices are forcing adjustments that will bring supply in line with demand. And that will make the upcoming spring season one of most challenging and risky in a long time.

Gas Markets Explode

Skyrocketing gas prices and eye-popping heating bills have captured front-page headlines. The chart – most likely published in your local newspaper sometime during the past month or so – shows that U.S. natural gas prices roughly quadrupled last year.



Gas Demand > Gas Supply

Gas prices have surged because demand has outpaced supply during the last few years. Robust economic growth has fueled strong increases in energy demand in general and electricity use in particular. That, in turn, has boosted the demand for natural gas, which accounts for approximately one-fourth of U.S. energy use.

The growth in electricity use has increased gas demand by utilities. Nearly all new generating plants – including units to meet peak demands – utilize gas-fired turbines. Gas turbines are highly efficient and make it easier for utilities to comply with increasingly stringent emissions standards.

In addition, low energy prices during the last half of the 1990s diminished incentives for the exploration and development of new gas reserves in North America. That caused gas production to stagnate during the last few years.

Gas prices likely will stay at high levels until the market is absolutely convinced that supplies are adequate to meet a worst case heating scenario. Gas prices were dropping sharply in mid-January, but values still remained at painfully high levels for North American nitrogen producers.

Nitrogen Plants Shut Down

High gas prices dealt a staggering blow to U.S. nitrogen producers. Nitrogen production is extremely energy intensive (see insert). The quadrupling of gas prices last year pushed variable costs into uncharted territory and forced producers who had not forward priced gas to either pass on higher costs to buyers or shut down (see insert).

And many producers shut down plants rather than bet on the uncertain outcome of turning high cost gas into high cost nitrogen. For example, U.S. ammonia plants operated

Nitrogen Production is Energy Intensive

According to The Fertilizer Institute's cost of production survey, large scale U.S. nitrogen plants used 33.4 million Btus (MM Btus) of gas to produce one ton of anhydrous ammonia in 1999. One MM Btu is equal to one thousand cubic feet (or MCF) of gas. Average ammonia production at large scale plants was 527,000 tons in 1999, according to the same survey. So, a typical large scale ammonia plant used 17.6 billion cubic feet (BCF) of gas in 1999.

How much gas is that? The local public utility indicates that a typical home in Minneapolis burns from 135 to 140 thousand cubic feet (MCF) of gas per year. That means a large scale ammonia plant uses as much gas in one year as <u>128,000</u> typical homes in Minneapolis! Alternatively, the gas used by a typical home in Minneapolis for an entire year would produce only <u>4</u> tons of ammonia. That's enough nitrogen to fertilize just 50 acres of corn!

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High Gas Prices Push Up Nitrogen Costs

The table illustrates the sensitivity of nitrogen production costs to changes in natural gas prices for a typical plant operating in the U.S. Gulf region. The costs are only **estimates** based on a model that utilizes results of The Fertilizer Institute's 1999 ammonia cost survey as well as best estimates for other cost components.

The table lists the cost of gas, variable costs (excluding labor) and cash operating costs per ton at the plant gate for ammonia, urea and nitrogen solutions at gas prices ranging from $4.00 per million Btu to $10.00 per million Btu.

For example, a producer buying $9.00 gas (close to the average daily index of $8.78 for December) would require plant gate prices of roughly $340 per ton, $255 per ton and $170 per ton for ammonia, urea and nitrogen solutions, respectively, just to cover cash operating costs.

The average New Orleans prices for ammonia and urea published by *Fertilizer Markets* during December were $221 per ton and $156 per ton, respectively. In other words, a producer turning $9.00 gas into ammonia and urea in December was betting on price increases of approximately $120 per ton and $100 per ton, respectively, just to cover cash operating costs!

Not surprising, producers who did not forward price all gas requirements shut down or curtailed output in response to these overwhelming economics.

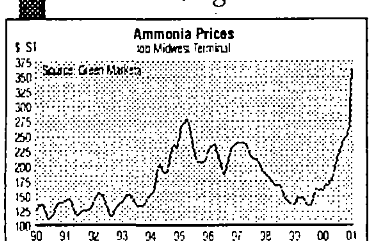
The Impact of Gas Prices on U.S. Nitrogen Costs

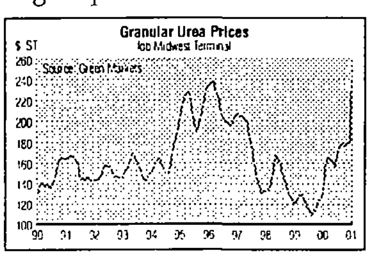
Estimated Cost fob Plant ($ st)	Gas Cost ($ MM Btu) $4.00	$5.00	$6.00	$7.00	$8.00	$9.00	$10.00
Anhydrous Ammonia							
Gas Cost	$134	$167	$200	$234	$267	$300	$334
Variable Cost	$144	$178	$211	$244	$278	$311	$345
Cash Operating Cost	$171	$204	$238	$271	$304	$338	$371
Gas Percent of Variable	93%	94%	95%	96%	96%	97%	97%
Gas Percent of Cash Op Cost	78%	82%	84%	86%	88%	89%	90%
Solid Granular Urea							
Gas Cost	$92	$115	$138	$161	$184	$207	$230
Variable Cost	$110	$133	$156	$179	$202	$225	$248
Cash Operating Cost	$140	$163	$186	$209	$232	$255	$278
Gas Percent of Variable	84%	87%	88%	90%	91%	92%	93%
Gas Percent of Cash Op Cost	66%	70%	74%	77%	79%	81%	83%
Nitrogen Solutions							
Gas Cost	$60	$75	$90	$105	$120	$135	$150
Variable Cost	$69	$84	$99	$114	$129	$144	$159
Cash Operating Cost	$97	$112	$127	$142	$157	$172	$187
Gas Percent of Variable	87%	89%	91%	92%	93%	94%	94%
Gas Percent of Cash Op Cost	62%	67%	71%	74%	76%	78%	80%

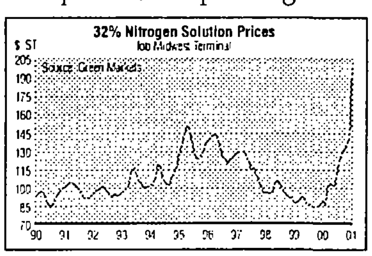
at less than 60 percent of capacity in December. Producers shut down additional plants in January and likely operated at approximately 50 percent of capacity during the month.

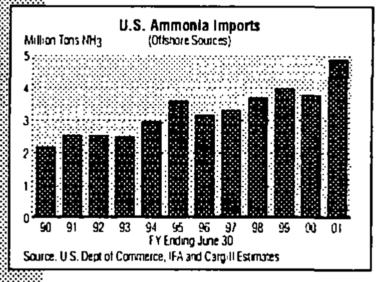
Nitrogen Prices Jump

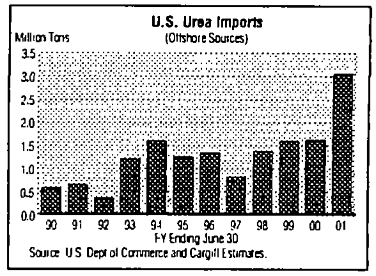
Rising costs and falling output have caused domestic







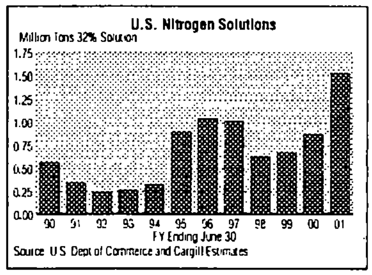




nitrogen prices to increase sharply since mid-December. In fact, the charts show that unprecedented cost-push pressures have propelled ammonia and nitrogen solutions prices through the peaks of the demand-pull cycle in the mid-1990s.

Nitrogen Imports Surge

High U.S. prices will attract record nitrogen imports during the 2000/01 fertilizer year. The projected increase in imports will make up a good portion of outut lost during the last two months.



The import season got off to a blockbuster start even before the surge in gas and nitrogen prices. For example, statistics from the U.S. Department of Commerce indicate that ammonia, urea and nitrogen solutions imports from offshore origins from July to November were up 11 percent (or 184,000 tons), 111 percent (or 538,000 tons) and 190 percent (or 393,000 tons), respectively, from the same period a year earlier.

Based on year-to-date statistics and estimates for imports from December to June, U.S. ammonia imports from offshore sources are projected to increase at least 1.0 million tons to 4.8 million tons. U.S. urea imports from offshore sources likely will increase more than 1.4 million tons to top 3.0 million tons, and U.S. nitrogen solutions imports are projected to increase 650,000 tons to 1.5 million tons during 2000/01.

Phosphate Costs Also Impacted

The run-up in gas and nitrogen prices has had significant spillover effects in other markets.

Phosphate costs were impacted in at least two ways by high gas prices. The initial increase in gas prices last fall forced the closure of the Main Pass sulphur mine. That tightened the sulphur market and pushed up prices $7.50 per long ton in the fourth quarter, boosting DAP production costs more than $3 per tonne.

The increase in sulphur costs, however, paled in comparison to the jump in ammonia costs in December and January. For example, the price of ammonia

DAP and MAP – Lowest Cost Sources of Nitrogen and Phosphate

Diammonium phosphate (DAP) and monoammonium phosphate (MAP) currently provide the lowest cost sources of nitrogen and phosphate.

The table lists the wholesale cost of nitrogen and phosphate for a half dozen of the most widely used fertilizer products. The first line is the cost in dollars per ton of product at Midwest terminals as reported in the January 15, 2001 issue of Green Markets. The second line is the cost in cents per pound of nutrient for those products that contain only one nutrient. The third line calculates the cost of nitrogen in DAP and MAP when the phosphate in these products is valued at the TSP price. The last three lines show the cost of phosphate in DAP and MAP when the nitrogen is valued at ammonia, urea and UAN prices, respectively.

If the phosphate in DAP and MAP is valued at the TSP price, the nitrogen in DAP is only 15 percent to 20 percent of the cost of nitrogen in ammonia, urea and UAN. And the nitrogen in MAP is free. These prices indicate that phosphate producers are transforming high cost ammonia into low cost nitrogen.

Alternatively, if the nitrogen in DAP and MAP is valued at ammonia, urea and UAN prices, the phosphate in these two products is only 40 percent to 75 percent of the cost of phosphate in TSP.

DAP and MAP: Lowest Cost Sources of Nitrogen and Phosphate

Wholesale Price Analysis	DAP 18-46-0	MAP 11-52-0	TSP 0-46-0	Ammonia 82-0-0	Urea 46-0-0	UAN 32-0-0
Green Markets Midwest Terminal Price on January 15, 2001 ($ per product ton)	175	181	160	345	235	190
Midwest Terminal Price (cents per lb nutrient)	na	na	17.4	21.0	25.5	29.7
Nitrogen Cost in DAP and MAP with Phosphate Valued at TSP Price (cents per lb N)	4.2	0.1	na	na	na	na
Phosphate Cost in DAP and MAP with Nitrogen Valued at Ammonia Price (cents per lb P_2O_5)	10.8	13.0	na	na	na	na
Phosphate Cost in DAP and MAP with Nitrogen Valued at Urea Price (cents per lb P_2O_5)	9.0	12.0	na	na	na	na
Phosphate Cost in DAP and MAP with Nitrogen Valued at UAN Price (cents per lb P_2O_5)	7.4	11.1	na	na	na	na

delivered to Tampa increased from less than $160 per tonne in September to approximately $240 per tonne in mid-January. The $80 per tonne increase in the price of ammonia boosted DAP costs more than $18 per tonne.

During the same period, the price of DAP fob Tampa dropped more than $15 per tonne. The combination of cost increases and price decreases severely squeezed DAP margins and forced phosphate producers to curtail output in January.

Weak fundamentals constrained phosphate producers from passing on cost increases to buyers. As a result, ammonium phosphate products clearly were the lowest cost sources of nitrogen and phosphate following the run-up in nitrogen prices.

Farmers Switch from Corn to Beans

The run-up in nitrogen prices also will stimulate demand responses. For example, higher nitrogen prices increase corn production costs relative to soybean costs. And that adds to already strong incentives for farmers to plant soybeans rather than corn.

Early acreage surveys indicate that farmers may switch as much as two million acres from corn to soybeans. Most of the switching likely will take place west of the Missouri River where farmers have not yet achieved a balanced rotation and where fall nitrogen application was below average.

A switch of two million acres likely would reduce U.S. nitrogen demand by less than one percent. That, however, is significant, particularly if the drop is concentrated by geography and by product.

Optimum Application Rates for Various Nitrogen Costs and Corn Prices (lbs N Acre)

Nitrogen Cost (cents lb)	Corn Price ($ bu) 1.75	2.00	2.50
15	175	179	183
20	165	169	178
25	154	160	172
30	148	154	166

The futures price for new crop corn traded in the $2.50 bu range during the month of January for the last two years. The cost of nitrogen in the form of anhydrous ammonia was 14.1 cents per lb. last year, but likely will rise more than 75 percent to nearly 25 cents per lb. this year. The table, based a typical nitrogen response curve in the Corn Belt, indicates that higher nitrogen costs will drop the optimal nitrogen application rate 6 percent or 11 lbs. from 183 lbs. per acre last year to 172 lbs. per acre this year.

Farmers Carefully Review Nutrient Plans

High nitrogen prices enhance the importance of nutrient management principles. First, match fertilizer application rates to realistic yield goals based on specific soil characteristics and moisture levels, reasonable expectations for crop prices and fertilizer costs, and a practical assessment of farm management abilities. The table shows the optimal nitrogen application rate for combinations of expected corn prices and nitrogen costs. Large changes in either corn prices or nitrogen costs are required to change optimal rates by a significant amount.

Second, soil test fields to determine phosphorous (P), potassium (K) and liming needs. Do not reduce or eliminate phosphorous or potassium applications on fields testing low to medium for P and K. Insufficient levels of P and K diminish the efficiency of and returns to nitrogen.

Third, always adjust application rates for nitrogen credits from alfalfa or soybeans and for the N-P-K content of manure if it was applied uniformly.

Finally, consider the timing of application, particularly nitrogen side dress this year. Split applications allow you to assess nitrogen requirements based on more agronomic and economic information. In addition, a break in gas prices could impact nitrogen prices by side dress season.

Impact of Higher Nitrogen Prices on U.S. Midwest Corn Production Costs

	April 2000	Spring 2001 Price Scenario Low	Med	High
Anhydrous Ammonia Price ($ per ton)	231	375	400	425
Anhydrous Ammonia Price (cents per lb N)	14.1	22.9	24.4	25.9
Application Rate (lbs N per acre)	180	175	170	165
Nitrogen Cost ($ per acre)	25.35	40.02	41.46	42.76
Nitrogen Cost Change from 2000 ($ per acre)		14.66	16.11	17.41

Higher nitrogen prices likely will increase corn production costs $15 to $17 per acre, depending on the retail price of nitrogen. The analysis assumes spring retail ammonia prices ranging from $375 per ton to $425 per ton. That compares to a Corn Belt average of $231 per ton last year according to the April 2000 USDA survey of prices paid by farmers.

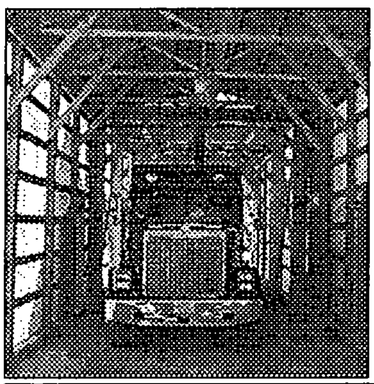
CARGILL NEWS

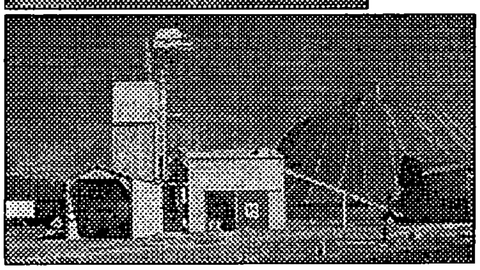
Customer Solutions

Cargill quietly has invested significant capital to expand and improve its fertilizer businesses during the last year. The investments not only enhance efficiencies and drive costs out of the system, but they also improve the quality, convenience and safety of the products and services delivered to our customers. Below are a few examples of customer solutions delivered by Cargill Fertilizer.

A Third High Speed Truck Load-Out Installed at Port Cargill

A third high speed truck load-out was installed last summer at Port Cargill, our flagship wholesale fertilizer terminal just south of the Twin Cities on the Minnesota River in Savage, Minn. The third system is used to load MAP from building 14. Identical systems were installed to load DAP from building 15 and granular urea from building 16 during the previous two years.





The three load-out systems were designed and built in conjunction with a new truck flow scheme implemented at the facility. Traffic engineers developed a new truck flow after a detailed evaluation of the existing flow that included extensive feedback from truckers who regularly served the terminal. In the past, truckers waited as long as eight hours to load during peak periods when more than 400 trucks per day were loaded at the facility. Truckers told us that long waits were unacceptable.

We listened. Port Cargill now can load more than 650 trucks per day with an average wait time of less than two hours. Trucks first weigh-in on one of two scales near the terminal entrance and then proceed to the fully automated load-outs. Trucks are loaded and weighed, and all of the paperwork is processed in as little as five minutes, down from an average of 20 minutes. Each load-out is covered to facilitate loading during inclement weather.

Retail dealers and truckers now find it less complicated, safer, faster and more convenient to buy and move a load of fertilizer from Port Cargill to their retail bins.

E-Crane Barge Unloads added to Port Cargill and Houston Terminals

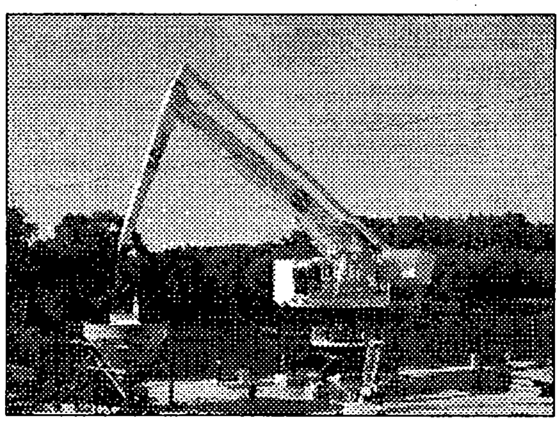
An equilibrium crane (or E-Crane) barge unload system was added to the Port Cargill terminal last September and an even larger system will go into operation at the Houston terminal in March 2001.

The installation of an E-Crane at Port Cargill coupled with a corresponding upgrade of the conveyor system doubled the capacity to unload river barges of fertilizer and salt at this terminal. The E-Crane boosts unload rates from approximately 350 tons per hour to 600 tons per hour. The E-Crane, equipped with an 86-foot boom and a 360-degree rotating bucket, enables the operator to clean barges more completely than older cranes, minimizing the time front-end loaders need to spend inside the barge finishing the job. As a result, the new system cuts the total time required to unload a barge from approximately eight hours to four hours. In addition, the new unload system reduces shrink, product degradation and barge demurrage. The system increases barge unload rates to roughly match rates at the three high speed truck load-outs at the terminal.

The Houston E-Crane is a larger version of the Port Cargill E-Crane. The Houston E-Crane will boast a 104-foot boom and lifting capacity of more than 700 tons per hour. The new E-Crane combined with minor adjustments in hopper and belt configurations will facilitate the unloading of vessels ranging from 1500 ton river barges to 18,000 ton cross gulf barges to 33,000 ton ocean going vessels.

The E-Crane also provides a safer working environment. Easy to use electronic and hydraulic controls improve ergonomics and the cab design enhances both the visibility and comfort of the operator

The E-Crane, developed more than 25 years ago in Europe, is completely hydraulic and designed specifically for repetitive material handling. It is called an equilibrium crane because a counterweight mounted on a hydraulic cylinder at the rear of the crane is synchronized with the boom to keep the crane in equilibrium at all times.

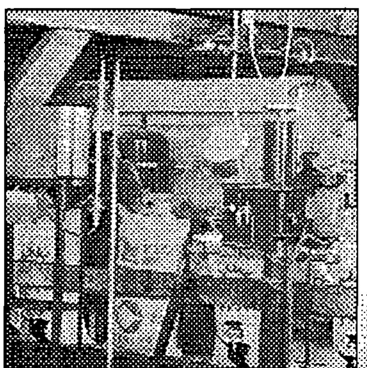


CARGILL NEWS

Cargill Opens Bulk Blending Plant at Yantai

Cargill officially opened its second bulk blending plant in China on August 16, 2000. More than 200 customers, suppliers and government officials attended the ceremony. The facility, located at Yantai in northeastern China, can produce up to 100,000 tonnes of bagged blends per year. The target market includes vegetable and fruit growers in and around the Shandong province.

The venture, incorporated as Yantai Cargill Fertilizer (YCF), utilizes granular urea, DAP, MAP, SSP, MOP and SOP to formulate blends tailored to specific soil and crop requirements. YCF contracts with the port of Yantai for logistical services including the discharge of raw materials and the load-out of bagged blends.



Cargill opened its first bulk blending plant in China at Tianjin in August 1996.

Cargill and YPFF Form Granulation Joint Venture

Cargill and Yunnan Phosphate Fertilizer Factory (YPFF) have formed a joint venture to build a granulation plant near Kunming in the Yunnan province in south central China. The plant is designed to produce DAP or MAP or NPKs. Capacity is 600,000 metric tonnes per year. The plant is under construction and completion is expected within 12 to 14 months.

The total cost of the project is approximately $22 million. YPFF will supply phosphoric acid to the joint venture at a formula cost tied to the price of DAP. YPFF currently operates a 130,000 tonne acid plant near Kunming and a new 180,000 tonne acid plant is under construction at the facility. Cargill will manage sales and marketing efforts for the joint venture.

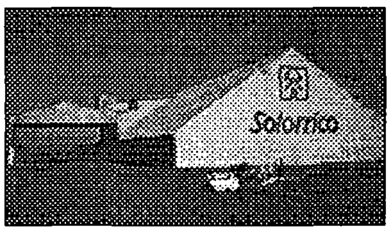
China, the largest phosphate market in the world by a wide margin, applies approximately nine million tonnes of phosphate per year. China possesses large phosphate rock reserves and ranks second behind the United States in rock production. China currently produces roughly three-fourths of its phosphate needs. However, approximately 80 percent of domestic output is in the form of low analysis and often low quality products such as NPKs, single superphosphate and fused magnesium calcium phosphate. China plans to aggressively develop a domestic phosphate industry that produces higher analysis and higher quality products that meet the increasingly stringent requirements of Chinese farmers.

CARGILL NEWS

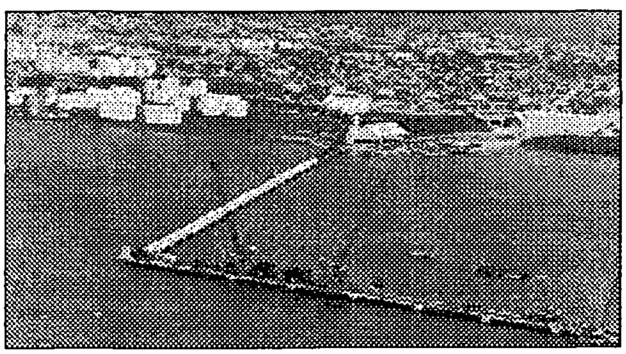
Cargill Adds Fertiza to Brazilian Operations

Cargill completed the purchase of approximately 80 percent of the outstanding shares of Fertiza last October. Fertiza distributed approximately 700,000 tonnes of bagged products last year through an extensive sales network in central and southern Brazil.

The acquisition comes just more than a year after Cargill acquired controlling interest in Solorrico. Solorrico distributed more than 1.3 million tonnes of fertilizer in the same region last year. The combined operations are expected to distribute approximately 2.4 million tonnes of fertilizer this year, accounting for 15 percent of the projected 16 million tonne Brazilian market. In addition, the consolidation of the two operations will generate significant cost savings.



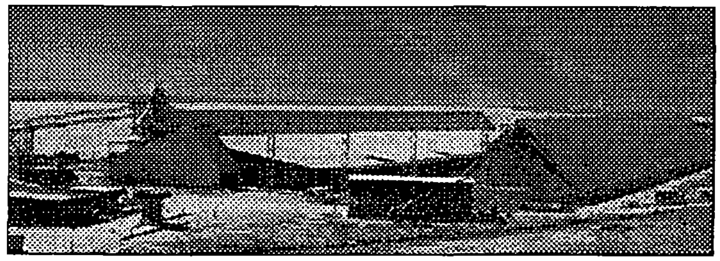
Fertiza operates a 460,000 tonne wholly owned bulk blending facility at Uberaba. Fertiza also owns significant or controlling stakes in a 576,000 tonne bulk blending plant at Cubatao, a 350,000 tonne single superphosphate plant at Paranagua, and the brand new fertilizer port at Paranagua with put-through capacity of two million tonnes per year.



In addition, Fertiza owns 10 percent of Fertifos, the holding company that controls Fosfertil. That combined with Solorrico's 23 percent share of Fertifos gives Cargill a one-third ownership stake in Fosfertil. Fosfertil, the largest nitrogen and phosphate producer in Brazil, operates three phosphate rock mines, one phosphate complex, two nitrogen plants and a modern port facility at Santos.

Cargill Doubles Quebracho

Cargill is constructing a second 60,000 tonne warehouse at its two-year-old fertilizer port in Quebracho Argentina. Construction of the new warehouse was approximately two-thirds complete in mid-January. The first phase of the port development was completed in August 1998 at a cost of $14.4 million.



The new warehouse will double storage capacity at the site to 120,000 tonnes and will make the Quebracho facility the biggest, fastest and most efficient port in Argentina. The new 12-bin warehouse also will include the first high-speed tower blender in Argentina.

The additional capacity and enhanced design will enable Cargill to meet the growing demands for nutrients as well as for specialized blends in the upper Parana River region. Target customers include both wholesale distributors who utilize the highly efficient storage, put-through, blending and bagging services at the Quebracho port as well as retail dealers who require more tonnage and specialized services to meet the growing and more sophisticated demands of Argentine farmers.

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